Chemistry 129.01 Quiz #1: 25 points

Name: Key

Show all your work!

1. (3pts) Determine the number of significant figures in the following:
   a) 35.00 4
   b) 0.0250 3
   c) 6.0180 5

2. (3pts.) Classify the following reactions by type (combination, decomposition, combustion, single displacement or double displacement):

   a) $2\ Na_{(s)} + Cl_{2(g)} \rightarrow 2\ NaCl_{(s)}$ Combination

   b) $CH_{4(g)} + 2\ O_{2(g)} \rightarrow 2\ H_2O_{(g)} + CO_{2(g)}$ Combustion

   c) $2\ AgNO_{3(aq)} + Cu_{(s)} \rightarrow 2\ Ag_{(s)} + Cu(NO_3)_{2(aq)}$ Single Displacement

3. (9pts) Balance the following reaction:

   ____ $Li_2S_{(aq)}$ + ____ $Co(NO_3)_{2(aq)} \rightarrow$ 2 $LiNO_{3(aq)}$ + ____ $CoS_{(s)}$

   a) What volume of a 0.150M Li_2S solution is required to completely react with 125mL of a 0.200M $Co(NO_3)_2$ solution?

$$\text{mol } Co(NO_3)_2 = (0.125\text{ L})(0.200\text{M}) = 0.0250\text{ mol } Co(NO_3)_2$$

$$0.0250\text{ mol } Co(NO_3)_2 \left(\frac{1\text{ mol } Li_2S}{1\text{ mol } Co(NO_3)_2}\right) = 0.0250\text{ mol } Li_2S$$

$$\text{L } Li_2S = \frac{0.0250\text{ mol } Li_2S}{0.150\text{M } Li_2S} = 0.167\text{ L} = \underline{167\text{ mL}}$$

   b) How much CoS, **in grams**, is produced from the reaction of Li_2S and $Co(NO_3)_2$?

$$0.0250\text{ mol } Co(NO_3)_2 \left(\frac{1\text{ mol } CoS}{1\text{ mol } Co(NO_3)_2}\right) = 0.0250\text{ mol } CoS$$

$$0.0250\text{ mol } CoS \left(\frac{91.00\text{ g } CoS}{1\text{ mol } CoS}\right) = \underline{2.28\text{ g } CoS}$$

2) (10 pts.) Elemental analysis of cadaverine (102.2 g/mol) shows that it contains: 58.55% C, 13.81% H and 27.40% N by mass. Determine the empirical and molecular formulas of cadaverine.

$$58.55\ g\ C\left(\frac{1\ mol\ C}{12.01\ g\ C}\right) = 4.875\ mol\ C$$

$$13.81\ g\ H\left(\frac{1\ mol\ H}{1.01\ g\ H}\right) = 13.673\ mol\ H$$

$$27.40\ g\ N\left(\frac{1\ mol\ N}{14.01\ g\ N}\right) = 1.9557\ mol\ N$$

$$C_{\frac{4.875}{1.9557}}\ H_{\frac{13.673}{1.9557}}\ N_{\frac{1.9557}{1.9557}} \Rightarrow (C_{2.49}H_{6.99}N)\times 2$$

$C_5H_{14}N_2$ ⇐ Empirical Formula → MM: 102.21 g/mol

$$n = \frac{102.2\ g/mol}{102.21\ g/mol} \cong 1$$

Molecular Formula: $1 \times (C_5H_{14}N_2) = C_5H_{14}N_2$